[0069] In a preferred implementation of the present invention, this complication is avoided by associating exactly three letters with each of the keys "2"-"9", and transferring the fourth letter of the "7" and "9" keys to the upward function of the key below. Thus, the letter "s" is activated by upward operation of the key corresponding to "*" and the letter "z" is activated by upward operation of the key corresponding to "#".

[0070] Parenthetically, it should be noted that this aspect of the present invention is not limited to touch sensitive implementations of a keypad. Specifically, the solution for rendering a "telephone-type alphanumeric keypad" using directional multifunction keys with no more than four direct functions per key is applicable to any keypad wherein each key is a multifunction key configured for single-contact selection of up to four functions. Thus, by way of one non-limiting example, this solution facilitate an implementation of the keypad of the aforementioned U.S. Pat. No. 5,528,235 with four-way keys instead of the five-way keys proposed therein.

[0071] It should be noted that the twelve-key telephone-type alphanumeric keypad referred to herein is not necessarily, or even typically, used alone. Thus, the aforementioned twelve keys may be supplemented by a number of additional keys for providing additional functions. In a particularly preferred implementation, the keypad further includes a row of keys associated with at least the functions ENTER, SPACE and DELETE.

[0072] It will be appreciated that the proposed key designations maintain the familiar overall layout with all four letters associated with the key '7' ('P', 'Q', 'R', 'S') surrounding the 7 label, and those associated with the "9" label disposed thereabout.

[0073] As implied by the text on the display zone **20** this embodiment gives a very good solution for a sending of an SMS over a touch screen equipped cellular phone. The user writes down very quickly the phone number and the desired alphanumeric message and the press send soft key to send it over.

[0074] According to a further optional feature of the present invention, the keyboard may be selectively operable in a single-function mode wherein a single function is selected on contact with a given key, independent of the direction of motion. This may be useful, for example, in a calculator mode or telephone dialing mode wherein only numbers are required.

[0075] The rest of this description describes another three preferred embodiments of multi functional keypads particularly suited to touch screen of devices using a square screen with size approximately 6 by 6 centimeter. Several additional options that can be used by a multi-function touch screen keypad are demonstrated. It will be understood that all features described in any one implementation are interchangeable between the various different implementations unless explicitly stated otherwise.

[0076] Referring now to **FIG. 3, a** preferred embodiment for Palm pilot touch screen is shown. The soft keypad contains **16** keys in a 4×4 matrix form. The left 12 keys are 6-way soft keys, while the upper left key is standard one function soft key, the two middle left are 4-way keys structure shown before and the lower left key is the same as key **106** shown in **FIG. 1**.

[0077] Key **110** is one of the twelve 6-way keys. The upper middle label corresponding to a move/tilt operation of the twelve keys are assigned to the 12 symbols of the telephone keypad while the lower line of labels assigned to left-down, down and right-down movement/tilt operation occupied with the Latin letters in alpha-bet order. The decision zones for an initial contact point in the center of the key are shown in **FIG. 5**. Six rays **420-430** create the decision zones with 60 degrees difference between adjacent rays.

[0078] **FIG. 6** show different layout based on QWERTY keyboard and 4-way multi-function keys. This keypad is more compact then the one in **FIG. 5**, however most of the non-letters text symbols are activated using a shift operation. The layout of the "shifted" keypad is shown in **FIG. 7**. The shifted keypad keep the layout of the shift operation of the QWERTY keyboard. In **FIG. 8***a* we see the details of the decision zones for key **112**, which is one of the 4-way keys in the keypad. The four rays **440**, **442**, **444**, **446**, create the decision zones. The activation operation in this key is by moving/tilting the finger toward upper-right, upper-left, lower-rights and lower-left direction instead of up, down, left and right in the keypad shown in **FIG. 1**. The bottom line of keys in the keypad has several unique keys for example key **114** is a 3-way key. The decision zones of key **114** are shown in **FIG. 8***b*. Referring momentarily back to **FIG. 8***a*, when the trace on the key contains only one point (from trace definition this point can be only the initial contact point and the user operation is actually a simple press on the key, referred to as a touch-and-release operation) since the initial contact point is on the boundary between all four zones the keypad controller will not activated any of the letters and error indication will be given to the user. Refer back to **FIG. 8***b*, since SPACE is frequently used, we would like to activate the SPACE even with just a touch-and-release operation on key **114**. In order to do that the zone of SPACE **324** should contains the initial contact point inside the zone. The small arc **452** is generated to support this feature so the boundary of the space zone is constructed from line **450**, **454** and the arc **452**. Any move/tilt down after the initial contact with the key will still produce a SPACE, however move tilt upwards will produce the '_' or '+' sign depended on the direction. The minimal length of line needed to activate the '_' or '+' equal to the length of the radius of the arc. All keys in the bottom line of the keypad have the lower function activation option with a simple press. Key **116**, the shift key has in addition another zone **330** as shown in **FIG. 8***c*. This zone is associated to a simple press operation on key **116**. In such case the shift operation is in action only for one consecutive press on the keypad. When the user move the finger downward when pressing key **116** (the trace is associate with zone **332**) the shift operation is act like 'CAPS Lock' and the shift operation stay in action until another press on the shift key is done by the user.

[0079] **FIG. 9** show yet another possible embodiment with 5-way keys keypad. An example of the decision zones of one of the 5-way key, key **120**, is given in **FIG. 10***a*. The center function (the number '1') is activated by a simple press on the key while the other keys are activated using press and move/tilt operation. The '1' zone is a small circle **460** around the initial contact point while the other four zones are constructed by four rays **462**, **464**, **466**, **468**. The bottom line contains three 2-way keys **122**, **124**, **126**. The zone constellation of that key is demonstrated over key **126** in **FIG. 10***b*. Key **126** contains two function the right one is the SPACE